Standard Operating Procedure

SOP-RDWC-CAN-S1: Root-Rot Treatment for Cannabis within RDWC Systems

Company / Operation: SKX-RDWC
Ab: Hydroponics / Cannabis Production
Contact: skx@hotmail.de / https://www.instagram.com/skx.rdwc/

Confidentiality: For internal use only – do not share without permission.

Revision No.	Extent of Revision	Date of Revision	Issued by	Approved by:
0	Initial Release	16.03.2025	SKX-RDWC	SKX-RDWC
1	Standard	19.03.2025	SKX-RDWC	SKX-RDWC

Introduction

Purpose of the SOP

This Standard Operating Procedure (SOP) is used for the systematic treatment of root diseases in cannabis plants in Recirculating Deep Water Culture (RDWC) systems. The aim is to ensure plant health, minimize yield losses and prevent re-infections without dismantling the system. The method uses H_2O_2 and HOCL for disinfection as well as separate quarantine of the plants for parallel processing.

Scope

This SOP applies to RDWC systems of any size that cultivate cannabis in the vegetative or flowering phase, taking into account specific requirements. The treatment lasts three days with a follow-up treatment until day 7.

Target pathogens

The SOP primarily targets root rot caused by Pythium spp., but is also effective against:

- Rhizoctonia solani: Brown roots, controlled by H_2O_2 and HOCL.
- Fusarium spp.: Reddish roots, effective against waterborne infestations.
- Phytophthora spp.: Root destruction, treatable by oxidative agents.
- Bacterial root rot (e.g. Erwinia spp., Pseudomonas spp.): Mucous roots, contained by HOCL.

Pests

This SOP can partially control the following pests:

- Root aphids (e.g. Rhizoecus spp.): Sucking insects, reducible by pruning and HOCL.
- Root nematodes (e.g. Meloidogyne spp.): Worms, partially controllable by removal.
- Thrips (larvae): Root-eating larvae, reducible by HOCL flushing.

Restrictions

This SOP is less effective against systemic infections such as Verticillium spp., which settle inside the plant tissue (especially in the vascular bundles) and block water and nutrient conductivity, leading to wilting and yellowing leaf. Since the treatment primarily targets external, waterborne pathogens, H_2O_2 and HOCL cannot reach or kill these fungi that are deeply anchored in the tissue. Similarly, SOP is not applicable to viral diseases, such as tobacco mosaic virus (TMV), which is spread by mechanical transmission or insects and infects plant cells. H_2O_2 and HOCL are oxidative agents that act on the cellular structures of fungi and bacteria but have no effect on viruses because they do not have independent cells and reproduce exclusively within the host plant.

Responsibilities

The Operator is fully responsible for the proper execution of these SOPs, as well as for any damage caused by improper use, deviation from the specifications or neglect of safety precautions. The creators of this SOP assume no liability for any results or consequences resulting from the use of this guide.

Materials Required

- Sterile gloves
- Scissors (sterilized)
- Measuring cups and pipettes
- Spray
- PH, EC, ORP, DO, Temp Meters
- Sterile water (RO water)
- Hydrogen peroxide (H_2O_2, 3%, 12%, or 35% food grade)
- Hypochlorous acid (HOCL, 300-500 ppm)
- Enzyme Products (i.e. Atazyme, Cannazym, Multizyme, PowerZyme, Sensizym)
- Nutrient solution (cannabis-specific)
- Quarantine containers/buckets depending on the number of plants
- 2x Rinsing container/bucket (>20L)
- Air pump and air stones
- Timer
- Air purifier or UV sterilizer (optional)

Safety precautions

- Wear protective clothing
- Use gloves
- Wear safety glasses (optional)
- Use a well-ventilated area
- Store chemicals carefully
- Avoid inhaling fumes
- Keep children away

Disposal Notes

- Used solutions: Dilute H_2O_2 and HOCL residues with water and dispose of them down the drain.
- Organic waste: Dispose of cut roots in sealed bags in the residual waste.
- Packaging: Recycle empty chemical containers when possible.
- Gloves: Dispose of used disposable gloves in household waste.

Prerequisites for success

The effectiveness of this SOP depends crucially on strict sterility to prevent the spread of pathogens and pests and to ensure the long-term health of cannabis plants. All tools, such as scissors or measuring cups, as well as materials, including quarantine containers and air stones, must be thoroughly cleaned with a suitable disinfectant before and after each use. Careful adherence to the steps described is essential to eliminate contamination and achieve the best possible results. In case of uncertainty about the correct execution or deviations from the expected results, the instructions should be repeated step by step. If there are doubts or problems arise that go beyond the SOP, expert support, such as a hydroponics expert, must be called in to avoid damage to plants or systems.

Procedure

1. Origin of root rot

Root rot is mainly caused by a lack of oxygen (DO <6mg/l), high water temperatures (>22°C) or pathogens such as Pythium. Contamination, for example from tap water or unclean tools, work areas and clothing, also promotes infection.
Incompletely dissolved nutrients can cause deposits and contaminants that promote anaerobic zones and interfere with root growth. HOCL (hypochlorous acid) and H_2O_2 (hydrogen peroxide) stand out as water solubilants. They break down deposits through their oxidative effect and prevent residues. At the same time, they keep nutrients evenly dissolved, increase oxygen saturation in the water, and prevent disease by killing pathogens.

2. Root rot detection

Early detection is crucial to limit damage. Visual inspection of the roots, water analyses and oxygen measurements are central methods to confirm the infestation. Symptoms on the plants such as wilting, yellow leaves or growth arrest despite optimal nutrients also indicate root rot. Hygiene and regular system maintenance are essential to prevent infections and to detect and contain them at an early stage.

2.1 Check symptoms:

I. **Roots:** Brown, slimy, foul smell
II. **Plants:** Wilting, yellow leaves, growth arrest despite optimal nutrients.
III. **Water:** foams, cloudiness, musty smell, decreasing oxygen content (optimal: 6-8 mg/L).

2.2 Confirmation: Visual inspection and DO measurement (in case of infestation < 6 mg/L).

2.3 Example Images

Image 1: Healthy root system

Figure 2: Root rot

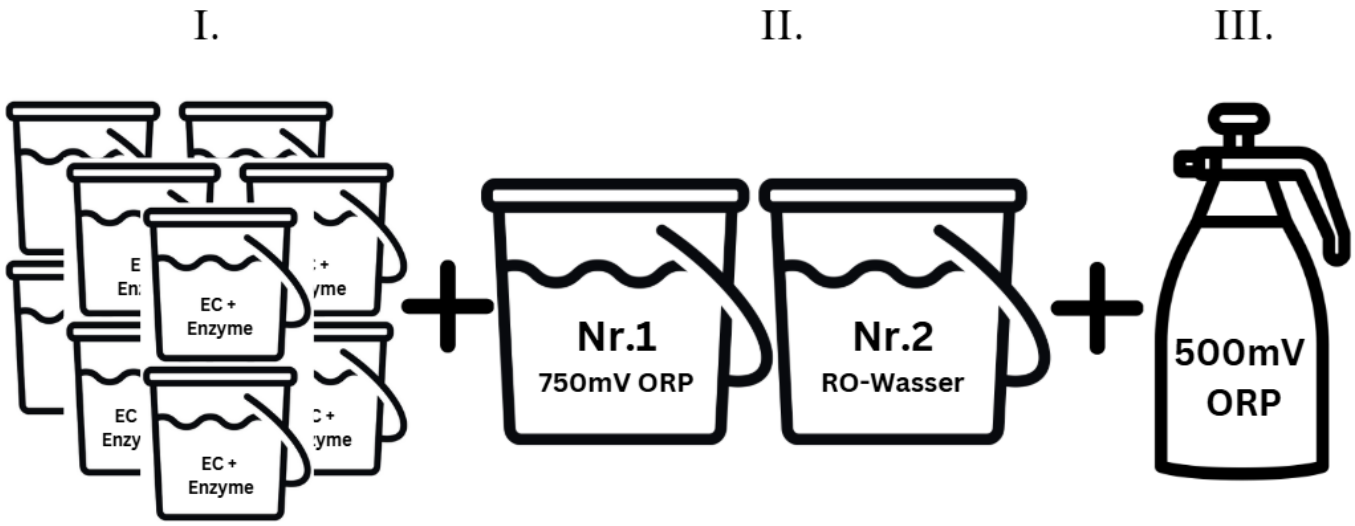
3. Preparation

Before starting treatment, the following steps should be taken to ensure effective and smooth implementation:

I. **Set up quarantine containers:** Make sure the containers are thoroughly disinfected beforehand to avoid contamination. Depending on the number of plants and the fertilization schedule, fill the quarantine containers with fresh nutrient solution and add enzyme preparations to them (**ATTENTION: only use half of the manufacturer's dosage recommendation**). Use clean air stones and air pumps, check the oxygen saturation (DO 6-8 mg/L).
Make sure that there is a quarantine container ready for each plant and that there is no residue or dirt. Keep the containers closed for the time being.

II. **Set up the rinse tank:** Fill two rinse tanks with fresh RO water (0.0 mS, pH 6.0, 20 °C). Infuse container No. 1 with HOCL up to an ORP of 750 mV to kill pathogens and flush off roots; Container No. 2 remains without HOCL for neutral rinsing for cleaning and residue removal. For the time being, store both containers closed, protected from light and in a cool place, and check the ORP value before use.

III. **Set up spray bottle:** Fill a spray bottle with a HOCL solution (RO water + HOCL) and adjust it to an ORP of 500 mV to disinfect work surfaces, racks, and tools. Test the spray function, store the bottle away from light and check the ORP value before use.



IV. **Check the system:** Check the system for potential sources of contamination, contamination and damage such as cracks, leaks or blockages in pipes, water filters, pumps, air stones and hoses; fix the problems immediately as soon as the plants are quarantined.

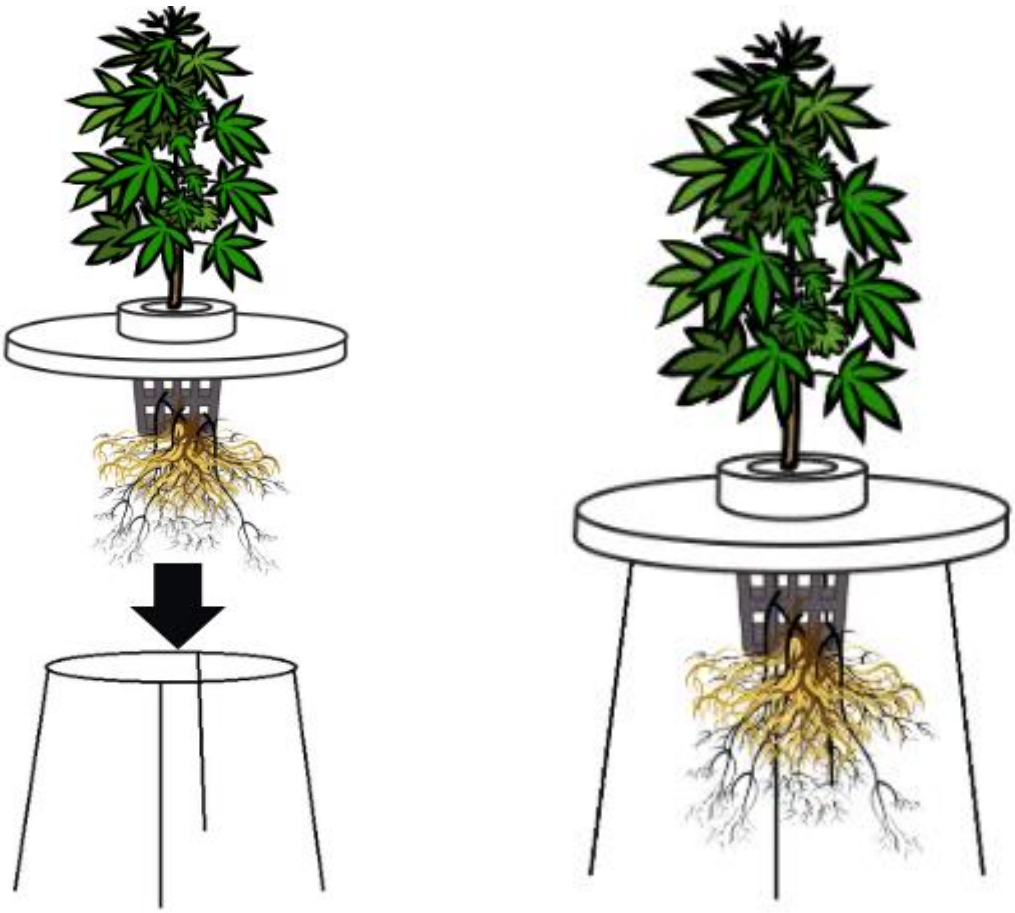
V. **Clean work area:** Disinfect all work surfaces, including surfaces on the RDWC system, with the spray bottle (III). Remove dust, dirt, plant debris and standing water and provide sufficient lighting to make the job easier.

VI. **Put on protective clothing:** Put on sterile gloves, optionally prepare protective goggles and have spare gloves ready in case they tear or get dirty.

4. Urgent measures

4.1 Carefully remove each cannabis plant individually from the RDWC system, including the lid and net pot, to make the roots accessible.

4.2 Fix the plant on a suitable fixture (such as a sturdy frame or worktop with a bracket) so that the roots hang freely and can be easily worked. Make sure that the roots do not touch the work surface or other surfaces.



4.3 In severely affected plants, cut off the dead, rotten roots (brown, slimy, foul smell) with sterile scissors, making sure to protect healthy roots and main roots.

4.4 After each completed plant, disinfect the scissors, the rack, the work surface, the plant lids (top and bottom), the net pot and the expanded clay stones with the spray bottle (III.) to eliminate contamination.

4.5 Temporarily return the worked plant to the system until all severely affected plants are treated before moving on to step 5.

5. Root treatment

5.1 Passive treatment for fewer or no infested plants

5.1.1 Remove a less or less infested plant from the RDWC system, including the lid and net pot.

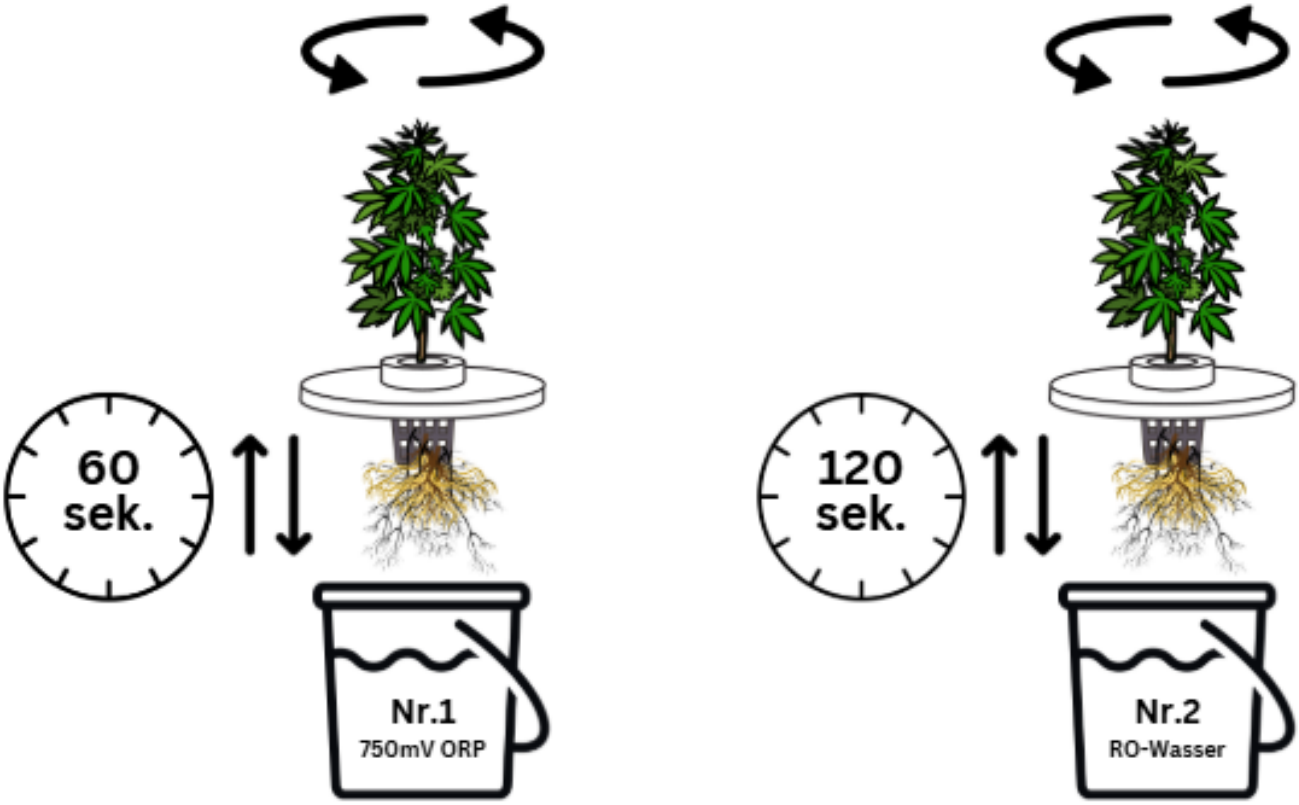
5.1.2 Flush the roots in the No. 1 rinsing tank with HOCL (ORP 750 mV) by up, down and twisting movements for 30-60 seconds max. to remove light impurities.

5.1.3 Next, rinse the roots in the No. 2 rinsing container with fresh RO water for 1-2 minutes to remove HOCL residues.

5.1.4 Place the plant in a separate quarantine container (I.) with fresh nutrient solution, equipped with air stones, for recovery.

5.1.5 Repeat the steps for any less or no infested plants.

5.1.6 Replace the solutions in the rinse tanks if heavy contaminants (e.g. turbidity or suspended solids) become visible, and prepare fresh solutions according to step 3



5.2 Active treatment in case of severe infestation

5.2.1 Carefully remove a severely affected plant that has been pruned in step 4 from the RDWC system, including the lid and net pot.

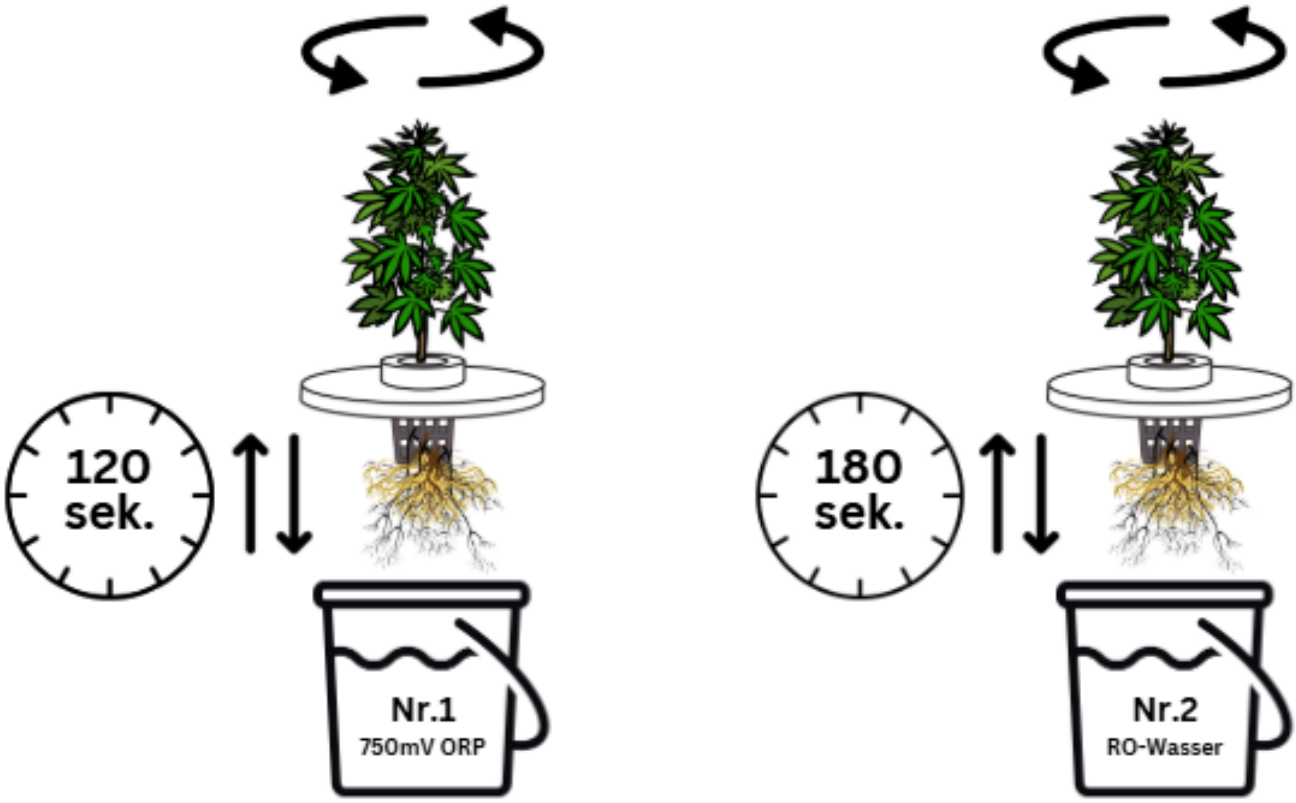
5.2.2 Flush the roots in the No. 1 rinsing tank with HOCL (ORP 750 mV) by up, down and rotary movements for 60-120 seconds max. to kill pathogens and repeat this process once (2 passes in total).

5.2.3 Then rinse the roots in the No. 2 rinse tank with fresh RO water for 180 seconds to remove HOCL residue.

5.2.4 Place the treated plant in a separate quarantine container with fresh nutrient solution, equipped with air stones, for recovery.

5.2.5 Repeat the steps for any severely affected plants.

5.2.6 Replace the solutions in the rinse tanks in case heavy contaminants (e.g. turbidity or suspended solids) occur and prepare fresh solutions according to step 3 .



6. System cleaning without dismantling

6.1 Pre-cleaning

6.1.1 Remove coarse contaminants (e.g. plant residues, dirt) from the system and pipes with a clean sponge.
6.1.2 Disinfect the accessible surfaces of the system with the spray bottle (III.) to eliminate germs.
6.1.3 Re-check for potential sources of contamination and eliminate them immediately.
6.1.4 Pay attention to damage to the system and blockages in all pipes and repair them immediately.

6.2 Reservoir grafting

6.2.1 Drain all water from the RDWC system.
6.2.2 Use a sponge to clean the inner walls of the buckets of debris and contaminants while the water drains.

6.3 HOCL Flush

6.3.1 Fill the system with RO water and add HOCL to an ORP value of at least 500-600mV.
6.3.2 Allow the system to circulate for 30 minutes, including the air pump and air stones.
6.3.3 During this process, clean all surfaces with a clean sponge and, if necessary, clean the inlet and outlet lines with a brush (toilet brush or dishwashing brush).
6.3.4 Then drain the HOCL solution completely.

6.4 H_2O_2 Cleaning

6.4.1 Fill the system with H_2O_2 solution (3 ml/L ~ 35%, 10ml/L~12%, 25ml/L~3%)).
6.4.2 Allow the solution to circulate for 60 minutes (90 min. at 3%), including the air pump and air stones.
6.4.3 Avoid all contact with the solution during this process and ensure adequate ventilation in the work area.

6.5 Rinse

6.5.1 Drain the H_2O_2 solution.
6.5.2 Rinse the system with sterile RO water (0.0 mS, pH 6.0) for 30-60 minutes.
6.5.3 Then drain the water completely.

6.7 Prepare a new nutrient solution

6.7.1 Prepare a fresh nutrient solution according to the fertilization schedule and add HOCL to an ORP value of at least 400mV.
6.7.2 Allow the system to circulate and check the oxygen saturation at hourly intervals with a DO measuring device (min. DO 6-8 mg/L).

7. Quarantine and plant treatment (in parallel with system cleaning)

7.1 Quarantine phase:

- Keep the plants in quarantine containers for at least 48 hours.
- Make sure that the enzyme preparation (e.g. Cannazyme) remains active to break down root residues.

7.2 Monitoring:

- Check daily root condition (new white growth) and plant vitality (no wilting).

7.3 Conclusion:

- After 48 hours (day 3), the plants are ready to return to the system, provided that the roots appear healthy and vital.

7.4 System Restore

- **System Function:** Check the circulation and the water temperature.
- **Oxygenation**: Check air stones, pump and oxygen saturation (DO > 6 mg/L).
- **Reset plants**: Return the treated plants to the net pots

7.5 Follow-up treatment and prevention

- **HOCL boost**: Keep your ORP value at min. 450mV for the first week and then lower it to 400mV.

7.6 Contraception:

- **Water temperature:** Keep the temperature constant at 20 °C and use a chiller for this.
- **Weekly rinse:** Use 0.5 ml/L HOCL (ORP approx. 400 mV) or 1 ml/L H_2O_2 (35%) to prevent contamination.
- **Precaution:** Regularly check air stones, pipes, and pumps for blockages or damage, and clean or replace them as needed.

8. Documentation

- Keep a report: date, time, condition before/after, agents used, pH/EC/DO/ORP values.
- Photos of roots (day 1 and day 7) for success evaluation.
- Preliminary Steps Photography and Documentation

Success metrics

- Roots show new white growth after 2-5 days.
- Cannabis plants recover (no wilting, green leaves, growth).
- Water remains clear and odour-free.